NAVAL WAR COLLEGE
Newport, Rhode Island

# RAPID RESEARCH AND DEVELOPMENT: THE OPERATIONAL COMMANDER'S ULTIMATE SMART WEAPON

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Maritime Operations.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Air Force.

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18 June 1993



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_____ 2/22/93
Faculty Research Advisor Date

UNCLASSIFIED
SECURITY CLASSIFICATION OF THIS PAGE

# REPORT DOCUMENTATION PAGE

| | |
|---|---|
| 1a REPORT SECURITY CLASSIFICATION<br>UNCLASSIFIED | 1b RESTRICTIVE MARKINGS |
| 2 SECURITY CLASSIFICATION AUTHORITY | 3 DISTRIBUTION/AVAILABILITY OF REPORT<br>DISTRIBUTION STATEMENT A; APPROVED FOR PUBLIC RELEASE; DISTRIBUTION IS UNLIMITED. |
| 2b DECLASSIFICATION/DOWNGRADING SCHEDULE | |
| 4 PERFORMING ORGANIZATION REPORT NUMBER(S) | 5 MONITORING ORGANIZATION REPORT NUMBER(S) |
| 6a NAME OF PERFORMING ORGANIZATION<br>OPERATIONS DEPARTMENT<br>6b OFFICE SYMBOL (If applicable)<br>C | 7a NAME OF MONITORING ORGANIZATION |
| 6c ADDRESS (City, State, and ZIP Code)<br>NAVAL WAR COLLEGE<br>NEWPORT, R.I. 02841 | 7b ADDRESS (City, State, and ZIP Code) |
| 8a NAME OF FUNDING/SPONSORING ORGANIZATION<br>8b OFFICE SYMBOL (If applicable) | 9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER |
| 8c ADDRESS (City, State, and ZIP Code) | 10 SOURCE OF FUNDING NUMBERS<br>PROGRAM ELEMENT NO / PROJECT NO / TASK NO / WORK UNIT ACCESSION NO |

11 TITLE (Include Security Classification)
RAPID RESEARCH AND DEVELOPMENT: THE OPERATIONAL COMMANDERS ULTIMATE SMART WEAPON (U)

12 PERSONAL AUTHOR(S) LYNCH,JAMES H. CAPT, USAF

| 13a TYPE OF REPORT | 13b TIME COVERED | 14 DATE OF REPORT (Year, Month, Day) | 15 PAGE COUNT |
|---|---|---|---|
| FINAL | FROM ____ TO ____ | 93 06 18 | 40 |

16 SUPPLEMENTARY NOTATION A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Operations. The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

| 17 COSATI CODES | | |
|---|---|---|
| FIELD | GROUP | SUB-GROUP |
| | | |
| | | |

18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
Research and Development, CAD/CAM, Acqusition, Procurement, operational level of war

19 ABSTRACT (Continue on reverse if necessary and identify by block number)

The limitless capacity of America's industrial power must be available to our unified and specified commanders to influence the outcome of future conflicts. Today's defense acquisition system does not allow this weapon to be used by the operational commander because of over regulation and congressional micro management. The capability exists in America's industrial base to produce weapons using CAD/CAM technology to meet real time battlefield needs. The last fifty years holds successful examples of rapid research and development successes, but all outside of the standard acquisition system. The Air Staff developed an effective process to reroute these requirements through the "system" during DESERT STORM and called it the Rapid Reaction Process(RRP). This RRP is the foundation for the changes I recommend to the unified and specified command J-8 staffs to facilitate future operational commander's needs. These recommendations include a Secretary of Defense level designation of a requirements review board(made up of J-8 staff) to dole out operationally required projects to the services to develop real time. These projects would be funded by the services, out of existing funds. This process would be formalized and exercised to insure it would function in war time. These recommendations would allow the operational commander to bring the weight of America's industrial prowess to bear on a conflict for it's successful resolution.

| 20 DISTRIBUTION/AVAILABILITY OF ABSTRACT | 21 ABSTRACT SECURITY CLASSIFICATION |
|---|---|
| ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ OTIC USERS | UNCLASSIFIED |
| 22a NAME OF RESPONSIBLE INDIVIDUAL<br>CHAIRMAN, OPERATIONS DEPARTMENT | 22b TELEPHONE (Include Area Code) 841-3414 / 22c OFFICE SYMBOL C |

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted
All other editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE
UNCLASSIFIED

0102-LF-014-6602

Abstract of

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The limitless capacity of America's industrial power must be available to our unified and specified commanders to influence the outcome of future conflicts. Today's defense acquisition system does not allow this weapon to be used by the operational commander because of over regulation and congressional micro management. The capability exists in America's industrial base to produce weapons using CAD/CAM technology to meet real time battlefield needs. The last fifty years holds successful examples of rapid research and development successes, but all outside of the standard acquisition system. The Air Staff developed an effective process to reroute these requirements through the "system" during DESERT STORM and called it the Rapid Response Process(RRP). This RRP is the foundation for the changes I recommend to the unified and specified command J-8 staffs to facilitate future operational commander's needs. These recommendations include a Secretary of Defense level designation of a requirements review board(made up of J-8 staff) to dole out operationally required projects to the services for real time development. These projects would be funded by the services, out of existing funds. This process would be formalized and exercised to insure it would function in war time. These recommendations would allow the operational commander to bring the full weight of America's industrial prowess to bear on a conflict for it's successful resolution.

# TABLE OF CONTENTS

# RAPID RESEARCH AND DEVELOPMENT: THE OPERATIONAL COMMANDER'S ULTIMATE SMART WEAPON

## Section I

## Introduction

Hog Butcher for the World,
Tool Maker, Stacker of Wheat,
Player with Railroads and the Nation's Freight Handler;
Stormy, husky, brawling,
City of the Big Shoulders.

*Carl Sandburg, Chicago*

In the twentieth century, America's place in the world has become Carl Sandburg's vision of Chicago. America and her technology and industrial strength perform all of the odious tasks the modern world requires to survive. The United States is the only remaining super power in a world that desperately requires stability and safety. One of the primary reasons for America attaining this status is our defense industry and it's proclivity to produce vast quantities of high quality weapons. America has the ability and capacity to produce these weapons not only for our own defense, but for our Allies as well.

The Entente could not have survived, let alone won World War One, without our material and industrial might. In World War Two our industrial alacrity again supported our allies and changed the course of the war. After World War Two, our industrial base remained the largest in the world and today still allows America to enjoy the world's highest standard of living. Our weapons are the envy and the benchmark for all of the other nation,s defense programs.

The well deserved reputation our weapons enjoy is a direct reflection of our military-industrial complex's technological supremacy. This technology and industrial base is as crucial to our nation's defense as any other facet of our nation's

power. Unlike other elements of national power, it is not harnessed efficiently to allow it's employment by operational commanders to influence the outcome of conflicts.

It is commonly held that all future mid to low level intensity conflicts will be "come as you are" operations. This mindset holds that the short duration of these conflicts will preclude the redirection of our industrial and technological complex to directly influence the conflict resolution. I reject this hypothesis and instead maintain that our nation's technological superiority can be focused in a very short time to save lives and ensure American and allied victory in future conflicts. In fact, my premise is that America's rapid research and development capacity is the operational level commanders ultimate "smart weapon".

This paper will first discuss the operational level commander's need for this rapid research and development capability and why it is not formally available today. Secondly, the inherent capability for our industrial base to rapidly adapt and respond to new requirements will be addressed. We will then investigate some recent examples where the industrial power of our nation was quickly focused outside of accepted channels, to solve problems operational commanders faced. Finally, we will look at some innovative measures taken by the US Air Force to support DESERT SHIELD/DESERT STORM and recommend improvements to those procedures. I'll conclude with recommended changes to the CinCs staffs and discuss some of the advantages these changes will give the operational level commander.

## Section II

## The Need for Rapid Research and Development

> Admiral Bobby Inman, ... said that in trying to create a perfect acquisition system, reformers turned it from one that took three to five years to field hardware in the early 1960s into one that takes three times longer to do the same job.[1]

Admiral Inman's comment in the 1970s reflects his prescient grasp of the state of military acquisition reform. The acquisition system has, through both over-regulation and congressional micro-management, grown into a slow moving system unable to respond quickly to changes our operational commanders need. The existing system provides for the Unified and Specified commanders to submit Integrated Priority Lists to the Chairman of the Joint Chiefs of Staff. The Chairman then uses this input to review the acquisition programs the services are pursuing. This ensures that the services are supporting the "war fighting" command requirements with appropriate future acquisition programs. This system, while functional, takes years for a new program to be started. The existing budgetary cycle is fine for force structure issues over the long term, but is not responsive to unforeseen requirements the CinCs may have to meet.

### Unforeseen Requirements

Examples of these unforeseen requirements might be a new crisis that emerges against an enemy that was once a staunch ally. If this occurred we wouldn't have appropriate equipment or intelligence to counter this unplanned threat. Another case might be a previously unknown capability that a traditional adversary

employs against us in a conflict. Since we didn't know the enemy had this capability we might not have suitable equipment to defeat it.

DESERT SHIELD/DESERT STORM gave us many examples of the unforeseen nature of enemy capabilities. CENTCOM had not known the extremely hardened command bunkers that Iraq used would resist our standard munitions prior to the conflict. This need created the GBU-28 "bunker buster" project discussed later. Another example of unforeseen enemy capabilities is that of the French built, KARI command and control system that Iraq employed. It was hard to jam or exploit because it was virtually unknown prior to hostilities.

The technology certainly existed to defeat these systems, but how could the CENTCOM commander get these solutions into the field? The American way of war has always been to use technology and firepower to minimize our own casualties whenever possible. If a technological solution is feasible, it should be employed if it will minimize losses to our troops on the battlefield. Waiting for the next POM cycle to submit a request and then waiting for it to be funded and developed clearly wasn't the answer for CENTCOM.

## The Defense Acquisition System

Even if the CENTCOM commander could put his new priorities into the defense procurement system, could the system respond quickly enough to help shape the outcome of this crisis? The answer to this question is a resounding no. The defense acquisition system takes seven to fifteen years to put out a product after it has been programmed into the service's budget. This time line is not driven so much by the complexity of the research activity, but by the over regulation and micro-management to which defense procurement is subjected.

## Over Regulation

The first problem, over regulation, is easily seen by comparing the amount of regulations existing in 1947 and the amount of regulations in use in 1987. In 1947, the Armed Services Procurement Regulation (ASPR) used approximately 125 pages to define all acquisition regulations for program managers. These regulations were based on the lessons learned from World War II, a time when the US defense industry was the supreme arms maker of the free world. In 1987, those same regulations, now inhabiting two separate sets of volumes, the Federal Acquisition Regulations (FAR) and the Defense Acquisition Regulations(DAR), number in excess of 1,200 pages. Not content with that preponderance of regulations, the FAR and DAR get new pages and supplements each month.[2]

These regulations are all designed to ensure that the acquisition process will produce a quality product by limiting the margin for error. The sheer number and size of these requirements have vitiated the effectiveness of the regulations. All the requirements that can be spelled out are, leaving very little flexibility for the program manager to eliminate unapplicable requirements, and worthless testing. The bottom line is that the results of program managers have not improved with the addition of more comprehensive procurement regulations.

The very preponderance of these regulations encourages the contract writer (usually a low level civilian or junior military officer) to copy standard clauses or "boilerplate" from previous contracts, regardless of the applicability. This indiscriminate practice results in such humorous contract requirements as a flight test program being required for a building modification contract.

The sheer size of the contracts (easily numbering in the hundreds of pages for a major program) makes each reviewer look at only his small portion. This parochialism produces contracts that have conflicting and redundant clauses that

increase the price of the contract with needless work. The size of the contract is a direct result of the over regulation forced on the acquisition process.

Recently the Aeronautical Systems Division Commander inserted a $100.00 bill into the middle of a Contract Data Requirements List attached to a proposed contract. He then sent this contract out for review among the functional specialists. When it returned no one had removed the $100.00 dollar bill. This cursory, narrow review drives costs up and extends schedules on acquisition projects.

## Costs of Over Regulation

The direct and indirect costs of over regulation(the FAR and DAR) are not trivial. A decade ago, an aircraft company president noted sadly that 27 percent of the flyaway cost of an airplane was for documentation and specifications.[3] This cost is not limited to increased prices, but also includes extended development and production schedules. The extended schedules increase the cost of a program by increasing the amount of time a contractor must keep his workforce on the payroll for a particular project. While the costs are not insubstantial, the more important issue to the operational commander is the amount of increased time the system sits in the factory and not in the field were it can be employed. The increased amount of time to field a program can also be attributed to Congress's micro- management of defense programs.

## Impacts of Micro Management

Micro management by Congress slows the procurement process and increases costs just as over regulation does. As a general rule, the more complicated and profuse the regulations and layers of review, the greater the time required to obtain

approval to perform even relatively simple tasks. The time it takes to win approval ends up robbing a program of its technical advantage and increasing the overall program cost.[4] The loss of technical advantage is a serious consideration in high technology weapons acquisition. Norman R. Augustine, head of Martin Marietta, notes that hardware and software development takes "slightly over eight years for the median major system-- in spite of the fact that many of these systems incorporate technologies with *half-lives* of less than five years[Emphasis in original]".[5] Such micro management forces the acquisition commands into the untenable position of fielding systems that are almost obsolete before they are fully integrated into the nation's arsenals.

In addition to delaying programs through micro management, Congress also mandates competition of almost all defense business. This competition is to avoid perceived cost gouging by "sole source" contractors. This cost "savings" strategy not only increases the time and government overhead required to conduct a competition in addition to the normal contracting cycle, but it also fails to achieve any real cost savings. As Donald Pilling states in his definitive work on defense competition: "The evidence fails to demonstrate that procurement competition does in fact reduce program cost. Competition in the AIM-7F program actually increased costs...competition should be considered more of a cost *avoidance* measure than a cost *reduction* device, [Emphasis in original]."[6] If competition only keeps costs from rising, and government agencies have to increase in size to conduct these competitions, the net result is an increase in overall program costs.

The results of Congressional over-regulation and micro management are virtually the same, increased program cost and extended program schedules. Both of these results combine to lessen the effect our technology base could have as another weapon the operational commander could use to alter the outcome of a conflict. The increased program costs make his inputs to the Chairman of the JCS harder to fulfill

and limit the numbers of systems that can be bought by the fixed and limited military budget. The most crucial impact on the operational commander however, is the increased development and production time. The standard development schedule, as it exists today, is unable to meet any kind of quick reaction capability that may be desired by an operational commander.

Is it only the management of our technology base that keeps it from being a viable weapon in the operational commanders arsenal ? Does America's defense industry have the agility to design and produce specialized weapons quick enough to rush to the battlefield for the commander to employ? We will examine the answers to these questions in the next section.

## Section III

## Capability to Develop and Produce New Weapons

The computer revolution seized America's research parks and industrial centers in the first skirmishes of the third industrial revolution and has been firmly entrenched ever since. America possesses some of the most modern factories and design facilities in the world. Most of these have been structured around the widely acclaimed Computer Aided Design(CAD) and Computer Aided Manufacturing(CAM) systems. These CAD/CAM systems are so pervasive that they are "no longer considered a luxury, the technology is a necessity"[7] if a company wants to compete in today's business environment. This technology is so widespread that you can find such mundane products as shower heads and car roof racks being designed with CAD/CAM systems.

### Computer Aided Design Advantages

Industry is embracing the CAD/CAM system because it facilitates the concurrent engineering concept.[8] This concept integrates the design and production disciplines in one product oriented team. This team approach, coupled with CAD/CAM methods produces very impressive gains in productivity and decreases product development time. McDonnell Douglas Helicopter predicts the number of changes required for its new commercial helicopter, the MD-900 Explorer, will be one quarter to one half of those experienced on previous projects.[9] This savings is directly attributed to the use of CAD/CAM and the concurrent engineering approach it supports.

The big payback to the operational commander is the savings in development time over traditional design processes. An example of this savings can be seen at

Sikorsky Helicopters. When Sikorsky designed the CH-53E Super Stallion, it took 38 draftsmen about six months to create the drawings of the helicopter's contours. On the current RAH-66 Commanche, one person using a CAD/CAM system can complete the same task in one month.[10]

These time savings aren't limited to the administrative work alone. The CAD/CAM systems enable the engineers to model performance on a computer with software before any hardware is built. This flexibility allows them to explore more alternative concepts before deciding on one prototype to test. Engineers can go through 20, 30 or even 50 design iterations, where before they were restricted to doing just a few using traditional methods.[11] These additional iterations allow the desired performance criteria to be satisfied quicker and cheaper than before because the design is refined on a computer instead of during an expensive, time consuming flight test.[12]

**Computer Aided Manufacturing Advantages**

While the design part of CAD/CAM has led to impressive gains, the manufacturing side has also yielded spectacular gains in productivity. Rockwell International uses CAD/CAM technology to verify producibility. Typically a prototype requiring 8 hours of machine time can be simulated using CAD/CAM in about 20 minutes.[13] Once a part is verified it can be rapidly prototyped by another computer aided manufacturing machine so that the engineer can fit it together with existing parts to ensure it works properly before expensive, time intensive tooling is created. The new Cubital Soldier 5600 can even create complex solid models from liquid polymers. These models include inter-locking gears and fully functional universal joints produced in one piece. The models work immediately when complete and can be made with any CAD/CAM system produced design.[14] These

models save huge amounts of time and money by allowing prototypes to be constructed, tested and accepted before investing in tooling.

## CAD/CAM Benefits to the Operational Commander

The flexibility and agility of CAD/CAM supported concurrent engineering can respond quickly to the combat needs of operational commander's. The system can provide a wholly new capability or a modification to an existing system. As Sikorsky President Eugene Buckley said, "an aircraft that once was developed in five or six years can now be created in two or three."[15] Managed properly, CAD/CAM provides the strategic benefit of time. Time is a weapon that can be equated with money, productivity, quality and innovation.[16] To the operational commander, this strategic benefit of time can translate directly into troop lives saved and mission accomplishment.

The American industrial base has the agility required by the operational commander to produce specifically tailored weapons in the time needed, except for the encumbrance of our weapons acquisition process. If freed from our self-imposed artificial restraints can the industry base create weapons in "real-time" for our commanders? The industry base can and has performed such feats in previous conflicts as the next section will illustrate.

## Section IV

## Historical Examples of Rapid Research and Development

The history of our wartime manufacturing is rife with examples of "crash programs" implemented to solve unique operational problems. I have selected five such programs to illustrate the ability and successfulness of the rapid research and development concept. With each example I will first summarize the operational problem that precipitated the technology solution, then give the solution and it's results in combat. These examples illustrate how potent a weapon the US military industrial technology complex can be.

### The Lockheed P-80 "Shooting Star"

In June 1943 the US Army Air Force worried about encountering large numbers of the German built Me-262 jet fighters over Europe. These fighters with their superior speed would be invincible to the current generation of Allied fighters and posed a serious threat to decimate our bomber force. A new fighter had to be developed to escort our bombers and to defeat the Me-262.

The Army Air Force went to Lockheed and requested a proposal for an all new turbo-jet powered fighter. One week later General H. H. "Hap" Arnold personally approved Lockheed's proposal to build this all new aircraft within 180 days.[17] Lockheed's "Kelly" Johnson formed the now legendary "skunk-works" to produce the P-80 Shooting Star. Lockheed at the time was manufacturing 17 P-38s, 4 B-17s, and a total of 28 Hudsons, Lodestars and PV-1s every day! With this huge workload there were no spare engineers for this new project. Instead, Kelly formed the first ad hoc concurrent engineering team to develop the P-80. [18]

From such an austere and unauspicious start the skunkworks designed, built, and completed preliminary ground tests on the first prototype XP-80 in 141 days.[19] The XP-80 was accepted and flight tested on day 143, beating the 180 day target imposed by the Air Corps. After the successful flight, the Air Corps decided to switch to a domestically produced General Electric Engine and add more armament to the aircraft. These changes required a complete redesign of the aircraft. The skunkworks produced this 50% larger variant, the XP-80A, in 132 days. This prototype became America's first operational tactical jet fighter. More than 6,000 were built in five different variations.[20]

The threat for which the P-80A was built didn't materialize in World War Two, but the P-80A was ready if required. The record of going from a "clean sheet of paper" to a finished, flying prototype in 143 days is certainly impressive. This example shows what a formidable weapon America's industry can be if focused on a problem with no over regulation or micro management to encumber the program. On the P-80 project only six military officers were involved and they made decisions on the spot, without having to get clearance from higher authority.[21] This decentralized execution of acquisition authority allowed Kelly Johnson to produce America's first operational jet fighter ahead of schedule.

**The North American F-86 "Sabre"**

In the dark days of the Korean War, when UN troops were retreating from the Yalu, only airpower could be counted on to provide "heavy weapon" support to our harried troops. However, the ground attack aircraft providing this support could not drop bombs in support of troops and fight opposing fighters for air superiority. This crucial mission of air superiority fell to the F-86 Sabre Jet squadrons.

The principal air superiority threat was from the numerous Chinese fighter squadrons operating Russian built MiG-15s. These aircraft proved technologically superior to the F-86D, with the edge going to the UN forces only because of the quality of our pilots. A technological edge was sought by the Air Force and the North American Aircraft Company started to investigate a method of improving the F-86Ds performance, especially in speed and turn radius.

The engineers at North American developed an extended non-slatted leading edge for the wing. In August of 1952, they test flew three aircraft with these new leading edges. The tests produced a dramatic improvement in combat capabilities. This modification increased aircraft speed and allowed it to fly closer to the maximum G-limit before buffet commenced. The trade offs for these advantages were increased stall speed at take off and an extended landing roll due to an increase in landing approach speed.[22]

The Air Force decided the combat advantages outweighed the costs and ordered future versions of the F-86 to incorporate these modifications. In addition, the Air Force ordered 50 modification kits shipped to Korea to retrofit F-86s in combat. The very next month, 50 kits were shipped to Korea for installation. Additional kits were ordered to retrofit all remaining F-86Ds to the new configuration.[23]

The advent of the new extended wing version in theater had a tremendous effect on the air fighting there, finally giving American airmen technological superiority over the opposing MiG's.[24] The aircraft equipped with the extended wings were redesignated the F-86F and issued to the 335th Squadron of the 4th Fighter Wing in September 1952. In the remainder of the year the 335th destroyed 81 MiGs, while the other two Squadrons in the Wing destroyed a combined total of only 41 aircraft.[25]

The phenomenal success of this combat modification demonstrates again how the technology and industrial base of America can be focused on an unexpected enemy capability and produce a solution quickly. A system modification is an excellent vehicle for such a combat problem demanding an immediate solution. By only modifying an existing weapon system, you still retain the benefits of your existing logistics system and training infra-structure. The operator and service personnel of the modified weapon system normally need only minor retraining and are able to use spare parts, documentation and other support from the "in place" logistics system. The option to modify an existing system to meet a combat requirement is still viable for the operational commander as is evidenced by the following DESERT STORM example.

**The GBU-28 "Bunker Buster" Munitions**

During DESERT STORM it became evident to the CENTCOM staff that the hardened Iraqi command and control bunkers could withstand the US Air Force's BLU-109 improved 2,000 pound warhead used to destroy hardened aircraft shelters. CENTCOM needed to destroy the crucial command nodes housed in the bunkers to save Coalition lives during the ground campaign. The CENTCOM staff asked the Pentagon for a weapon that would penetrate these extremely hardened, deeply buried bunkers.[26]

Engineers at Lockheed Missiles and Space Co. worked with engineers in the Air Force and Army to design a bomb that could penetrate the Iraqi bunkers. They took an existing Army stock of 8-inch, self-propelled gun barrels, machined them to make them larger, filled them with a mixture of two kinds of molten Tritonal, added a BLU-109 fuze/tail fin assembly, and a GBU-27 guidance package.[27] This entire project took 17 days to complete after project go-ahead. The resulting product was a

4,700 lb bomb capable of penetrating 100 feet of earth or 20 feet of concrete.[28] Two GBU-28 bombs were used on Iraqi command bunkers during the war with great success. The entire project, including testing and the production of 30 weapons cost less than $10 million.[29]

This example shows how a new weapon can be created quickly, and maintain commonality with systems already in the inventory, and be employed by operators without any special training. The F-111F crews who dropped these new bombs dropped them just as they would a GBU-27 laser guided bomb. The computer guidance package modification steered the new heavier bomb to it's target.[30] The result was an exact solution to a heretofore unfulfilled operational requirement: a fully employable weapon requiring little or no retraining, developed in "real time" to meet the operational commander's mission needs.

The acquisition story of the GBU-28, is nothing short of sensational. Army and Air Force Development communities teamed with the contractor where they could blurring the traditional roles played by each part of the military industry team. The military-industry team functioned as only wartime exigencies allow it. Art Spencer, Chief of the Air Force Explosives Lab that filled the bombs said, "throughout the GBU-28 effort we didn't go through any red tape for any of our requests, no matter how unusual".[31]

Even though the development, testing, and fielding took place in 17 days, the entire process from the time the operational commander identified his requirement and the first bomb dropped took only six weeks. This contrasts starkly with the 6-8 months of paperwork and the one and a half years of development and flight testing needed to produce a similar weapon in peacetime.[32] Were any "corners" cut in this development? Was this product unsafe in anyway? Were the costs of this project out of scope with the effort and value of the project? The answer to all of these questions is an unqualified NO! The 30 GBU-28's cost a mere $10 million, and remain in the

inventory. Hopefully the GBU-28 example will be used to refute some of Congresses demands for stricter acquisition controls and will make the case that reforms are needed to eliminate some of the existing rules.

Not all rapid research and development programs are undertaken to overcome new or unforeseen enemy capabilities. The next two examples we will explore are problems that had been previously identified and had plagued our forces in peacetime. They were not deemed important or pressing enough to be solved until actual combat highlighted their importance. The burden to solve these problems then fell on the operational commander who had the additional handicap of trying to solve them in the combat arena.

**Anti-Fratricide Identification Devices (AFIDs)**

"Friendly fire" or fratricide as the military calls it, is as old as war itself. The measures used to prevent fratricide have not kept pace with modern battlefield technology. In the gulf war the anti-fratricide measures took the form of inverted Vs painted on the side of vehicles, or fluorescent panel markers. Neither of these measures proved much use on the DESERT STORM high-technology battlefield. This battlefield can best be characterized as being fought beyond visual range or at night with Night Vision Goggles (NVGs).

Fratricide was an issue even before the ground offensive started, 11 Marines were killed in two separate incidents at Khafji in late January. [33] This tragedy brought the issue of fratricide to the forefront and DESERT SHIELD/DESERT STORM officials began casting about for quick technology solutions.

An American technician who read of the fratricide incidents quickly developed a device that he thought could solve the problem. [34] The Army rapidly evaluated the design and assisted the technician's company in making over 100

mechanical, electrical and functional design changes in the next four days. After these changes were incorporated three different preproduction units were rushed to Marine Air Station Yuma for tests against 22 other competing systems. After three nights of tests one of the AFIDs was selected for immediate production and deployment.[35] The Army shipped 395 AFID units to DESERT STORM troops prior to the cessation of hostilities, a scant 19 days after the Army first learned of the AFID. Within 24 days, 3,000 units were ready for shipment. The Army eventually received 10,000 units.[36]

The AFID example shows how rapidly American industry can be mobilized to solve an operational commanders immediate problem. Unfortunately, the process was not started earlier. Out of 148 coalition combat deaths, 35 were traced to friendly fire in 28 separate incidents during the gulf war.[37] Certainly some of these deaths could have been prevented if the military had prioritized anti-fratricide devices higher during peacetime requirement funding drills. Industry had the capability to solve the issue even in wartime, but was not directed to do so until too late. Is this a problem of the acquisition system ? Or is it a problem with the unified and specified commanders not wanting to allocate scarce peacetime development priorities for a capability that is a common problem, and not unique to one commander? There seem to be certain requirements that have no constituency within a service, a unified, or specified command. The bill for these requirements is paid in blood during a conflict by our troops. The next example is another peacetime neglected requirement that became deadly serious when troops deployed to DESERT SHIELD/DESERT STORM.

## Chemical Protection for Troops and Aircrew

Chemical weapons are so sinister, and the fear of them so well founded on the experience of World War I, that we forget the marginal value they have against well-prepared armed forces. The first use of chlorine gas in World War I killed 5,000 British soldiers in one evening. But two years later, after allied soldiers were properly equipped for the threat, only one of every 36 fatalities was attributed to chemicals even though half of the enemy's shells contained gas.[38]

Chemical weapons only pose a threat to the unprotected or unprepared. The ability to employ chemicals is often impaired or denied altogether by atmospheric conditions. Chemical weapons are, by their very nature, easily broken down or dispersed to less than effective concentrations by temperature variations, wind or rain. It is estimated that an effectively targeted, chemical attack on a combat unit in protective clothing and masks would inflict no more than 5% casualties. High explosive ordnance would wreak much greater damage on the same unit.[39]

The danger to our troops from chemical weapons in DESERT SHIELD/DESERT STORM would have been inconsequential if they were protected by chemical suits and masks that reflected the high state of technology our armed forces employed. However, this was another requirement that had been placed on the "back burner".

Our chemical protection systems had not kept pace with technology, nor had they been modified to correct inherent limitations, known to the Army for more than 25 years.[40] New masks had been developed to overcome these serious limitations, but according to a GAO report on the subject they "had been continually delayed due to various contracting problems".[41] These "contracting problems" had persisted for more than three years. If DESERT SHIELD/DESERT STORM had not been launched the problems with masks would probably still be unresolved.

The imminent and credible threat of chemical attack on coalition forces by Iraq forced the issue to the front and CENTCOM became a very interested party in solving these shortfalls. The acquisition system responded to the gulf crisis by awarding emergency contracts in August and September of 1990, for additional suits, mask filters, and cooling systems.[42] The Allied industrial capacity was sufficient to start overcoming the previous contracting problems and equipment was finally being delivered by the war's end.

In addition to ordering new equipment, existing stocks of chemical protection equipment were looted throughout the world and brought to DESERT SHIELD/DESERT STORM. These withdrawals of equipment from other stores seriously depleted the worldwide stocks below required levels.

Our troops experienced no shortfall in chemical protective equipment, because the enemy never used chemical weapons. If Iraq had employed chemical weapons in any scenario greater than a one time nuisance attack, it could have proved disastrous to our troops. After our troops exhausted their deployed chemical protection assets, there would have been no "safety net" of additional out of theater assets to fall back on.

Did CENTCOM officials worry about chemical protection prior to the war? How high was this requirement on their Integrated Priority List submitted to the Joint Chiefs? These are questions that point to another orphan of the requirements process. One that could have caused severe and gruesome losses to our forces. A GAO report on the subject states: "Although U.S. armed forces in the Persian Gulf did not experience shortages of chemical protective suits, masks, or mask filters, DOD **was not adequately prepared for chemical warfare."**[Emphasis Added][43]

As it happened, the services realized they needed to step up delivery of these items and went so far as to contract with Allied(British) firms for gap filling

substitutes.[44] The Marines even ordered a different type of suit than the standard chemical protection suit worn by the rest of the services.

The services bear the responsibility for "training and equipping" the forces the unified and specified commands employ during conflicts. Should the crucial responsibility of equipping forces be shared in times of conflict, between the "war fighting" CinCs staff and the services? Would the sharing of this role allow the operational commander to utilize this facet of national power to affect the outcome of a conflict? The CinCs already have the power to train forces under their command, why not allow more control over the acquisition process?

If CENTCOM had shared a role in the acquisition of the chemical protection suits, they could have standardized the suits provided. This standardization of requirements through out the conflict might have sped up the process of delivering chemical equipment to our deployed forces.

The role of the Unified and Specified commands in the combat acquisition process will be explored in the next section as we examine the Air Staff combat requirements process during DESERT SHIELD/ DESERT STORM.

## Section V

# DESERT SHIELD/DESERT STORM Air Staff Model

The Air Force, as all the services did, tried to provide the maximum support it could to DESERT SHIELD/DESERT STORM. At the Pentagon, the Air Staff developed a "Rapid Response Process"(RRP) to respond to time-urgent DESERT SHIELD acquisitions. This RRP was a formal process to provide new or increased capabilities to operating commands participating in DESERT SHIELD/DESERT STORM. The Air Staff recognized that our technology base could be employed to solve unique mission requirements. More importantly it recognized that the acquisition system in place would not be able to respond quick enough to deliver these needed capabilities. The RRP was therefore created to circumvent the standard acquisition cycle. The creators of the RRP included language in the charter that prevented commands from abusing this vehicle to develop projects not needed for the conflict. (The fact that such language had to be included points out how flawed the existing acquisition system had become.)

### The Rapid Response Process

The RRP system consisted of four basic steps. The first step was the development of, and coordination by CENTCOM of a Combat-Mission Need Statement(C-MNS). This statement validated requirements that were derived from DESERT SHIELD/DESERT STORM mission needs. The second step involved an action officer level feasibility assessment at the Pentagon. This feasibility assessment reviewed mission needs, technical feasibility, alternative solutions, and selected the best alternative to recommend to the General Officer Steering Committee. This recommended approach would then be briefed at the third step, which was a

decision briefing to the General Officer Steering Committee(GOSC). This committee of Air Staff General Officers would then decide whether or not the project should be approved. If the project was approved, it would proceed directly to the Vice Chief of Staff of the Air Force(AF/CV). This briefing to the AF/CV was the fourth step, and if approved the project would be immediately undertaken by the cognizant directorate. This entire RRP process would take place within 15 days of the need being identified by the using command to the Air Staff.[45]

**Results of the RRP**

The RRP was crucial in identifying and fielding many critical capabilities required by our forces. The RRP saw 35 projects submitted, 33 approved, and 23 fielded or at least partially fielded before the end of hostilities. Some of these successes were as trivial as an immediate acquisition of Global Positioning System(GPS) receivers for C-130 transports, to highly classified projects pushing the limits of new technology. In the latter case the earlier discussed GBU-28, "bunker buster" was one of these projects that was highly classified at the time, but has since been declassified.[46] All of these projects focused the strength of America's technology and industrial base on the problems of the operational commander. Finally, a formalized process existed for the Air Force to meet operational needs in a real time manner. The operational commander at last had a way to harness the U.S. industrial base to affect the outcome of a conflict.

The lessons learned from the war point out just how successful our high technology weapons were in limiting our casualties and enhancing our chances for victory. As one victory assessment said,"a fundamental message appears to be the importance of superior technology. Advanced weapon systems provided the U.S.

with a clear-cut advantage over Iraq, a nation which itself was equipped with some very modern Western systems."[47]

Without the RRP, many capabilities needed by our forces could not have been fielded quick enough to have seen action in this conflict. The RRP contributed significantly to the technologically superior capabilities fielded by the Air Force in DESERT SHIELD/DESERT STORM and would serve well as a model for all the services to adopt in future conflicts.

The following section discusses improvements to the unified and specified command staffs that would obviate some of my earlier criticisms of the existing system. The suggestions would allow the operational commander to use our nations industrial might as another tool to shape the outcome of a conflict.

## Section VI

## Suggested Improvements for CinC Staffs

The goal of the following improvements would be, as reiterated through out this paper, to allow the operational commander to use America's industrial base as another weapon to favorably end conflicts. This could be done by adding a collateral function to the J-8 Requirements branches of the unified and specified command staffs. This collateral function would be to consolidate requirements from the command for new capabilities needed during conflicts and to pass them on to the appropriate service for action.

The J-8 staff is in the unique position to be in theater, at the decision making headquarters of the conflict. This perspective gives the J-8 branch the insight required to prioritize and issue the requirements to the acquisition communities of each of the services. The J-8 already has the peacetime requirements mission and understands the acquisition process and has a working knowledge of the technology available.

An additional adjunct to assist the J-8 staff could be a deployed "Tiger Team" cell of acquisition officers. This cell would be made up of acquisition officers from each of the services to assist in the creation of the C-MNS, to advise on technical feasibility, and suggest alternatives at the point of inception. They would play a valuable role in the implementation of the technology once the new capabilities were developed and delivered. Their role would cover the spectrum of acquisition support from special logistics needs to specialized training.

Formalizing this rapid reaction process before a conflict occurs, allows the operational level commander to be aware of it's existence and be familiar with its use in times of crisis. Just like any other military capability if it is not exercised regularly, it won't work in the fog of war.

The formalization of the process will, by it's very nature, make it a joint capability. During DESERT SHIELD/DESERT STORM, only the Air Force had such a process. If the other services had been included the Army might have fielded the AFIDs, discussed earlier, prior to the ground war. This formalization ensures each service will be able to focus their uniquely specialized technology centers on the operational commanders problems.

The joint aspect of the process will also negate some of the redundancy in acquisition activities seen during the war. Complimentary capability might be desirous in some cases, but not when trying to allocate scarce research and development assets such as time, technical expertise, and manufacturing capability. This was exactly the case in DESERT SHIELD/DESERT STORM, when the Marines and the Army went out to procure chemical protection from the same limited sources. The services ended up competing among themselves and because the suits were of different designs, drove not only the price up, but the time required to produce the suits as well. Having the CENTCOM staff as the central controlling and directing agency for these rapid acquisitions could have resolved such conflicts. This centralized direction, and decentralized execution gives the commander a single point of contact for such a development capability, and therefore increases his productivity.

The concept of adding the collateral function to the J-8 staff's already full slate of duties is a sound one. However, as H. Ross Perot often says, "the devil is in the details" of a plan. The last thing needed in the acquisition community is another bureaucratic procedure to further slow the development process. A straight forward, common sense approach to this new process would be the most beneficial and efficient.

This approach would center around the existing acquisition process. The J-8 staff currently prepares the command's Integrated Priority List input for the

Chairman of the JCS. This duty requires the J-8 to understand the acquisition process and know the service players that will actually develop the systems. This knowledge will enable the J-8 to form a review board to replace the GOSC in the Air Staff example. Once they identify projects to be funded, they should be passed on to the service designated to execute the program. That service would then have to fund the program out of it's already appropriated funds. The designated service would have to sacrifice some existing program and hope to recoup this loss in future budgeting actions. This was done by the Air Force in DESERT STORM without adverse effects. The Chairman of the JCS will have to be cognizant of the process and influence services to share the pain.

The size and scope of the projects again should be defined by a common sense approach. The process is not meant to violate the intent of acquisition regulations, but only to provide for war time emergency actions. The projects considered for this process should be able to be employed in the current conflict. The greatest portion of the candidate projects should be modifications to existing systems. Modifications minimize development costs, impact to logistical and training infra-structure and provide the best hope of employing the new capability as soon as possible.

The operational commander would have the power to form a rapid research and development team if authorized by the Secretary of Defense during a conflict. This designation would not be automatic, but like activating the Civil Reserve Air Fleet (CRAF) would take a formal declaration by the Secretary. This formalization would assuage Congress's fears that the Rapid Research Process was an attempt to usurp their powers to control the armed forces procurement actions.

The process proposed by this paper is by no means unimprovable, but instead provides an intellectual jumping off point for further discussion and compromises. The crux of the concept is to enable the operational commander to

employ America's limitless industrial potential as an operational weapon. The process outlined does not integrate into the existing acquisition process but instead, it supplements it. This supplement fills the acquisition void the operational commander has with the existing process. The proposed process gives the operational commander the power to call out the forces of American industry to answer the tocsin of war. The recommended process finally allows the operational commander to bring all the resources of national power to bear on resolving conflicts.

## Section VII

## Conclusion

America's industrial and technological superiority is her greatest asset in peacetime and has the capacity of playing a larger role in conflict resolution. The conundrum is to focus this potentially decisive force to meet operational requirements that arise during conflicts. The further complication is that these needs must be met in real time for them to be effective.

The defense acquisition system, as it exists today, does not even do a very efficient job of meeting requirements without a time constraint. This inefficiency is due to many factors, but most agree that congressional micro management and over regulation are the biggest contributors. The specified and unified commands have a very well defined but small role in the setting of priorities in today's acquisition system.

In contrast to the inefficiency of the acquisition system, the development and production capabilities are increasing logarithmically spurred by new CAD/CAM systems. Industry's capability to develop and produce weapons in real time far outstrips the procedural ability of the military to procure them.

We looked at examples from the last 50 years, that showed how effective American industry was at meeting the challenge to produce weapons and modifications of existing weapons to counter real time threats. These examples showed that even problems that had festered unsolved during peacetime, could be rapidly solved, if industry was properly focused.

The Air Staff example in DESERT SHIELD/DESERT STORM illustrated how the defense acquisition system could be streamlined and focused on operational problems. This example gave us a glimpse of what is possible if we reorganize the

staff functions of the unified and specified commands to focus the heretofore untapped riches of our industrial capacity.

The rapid research and development capability of America is truly the ultimate smart weapon. It has almost unlimited capability and agility to solve any operational problem. It only needs the proper focusing that the operational commanders staff alone possesses. This is a weapon that can not be over looked in today's ever shrinking defense budget environment.

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